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Computer Programs

SIMPLY SUPPORTED CORED PLATE WITH UNIFORM PRESSURE
(H.G. Allen equations which includes shear deformation)

Navier Double Series Solution

$P := .361$ (pressure, psi) $a := 108$ $b := 96$ (a is the larger dimension, in)

$t_f := .22$ (thickness of faces, in) $h_c := 1.0$ (thickness of core, in)

$E_f := 1500000$ (Young's modulus of faces, psi) $\nu := .3$ (Poisson's ratio of faces)

$E_c := 0$ (Young's modulus of core, psi) $G_c := 22500$ (Shear Modulus of core, psi) $\nu_c := .30$ (Poisson's ratio of core)

$d := h_c + t_f$

$m := 1, 3 .. 21$ $n := 1, 3 .. 21$

$$D := \frac{E_f \cdot t_f^3}{6 \cdot (1-\nu^2)} + \frac{E_f \cdot t_f \cdot d^2}{2 \cdot (1-\nu^2)} + \frac{E_c \cdot h_c^3}{12 \cdot (1-\nu_c^2)} \qquad D = 2.728 \cdot 10^5$$

$$\rho := \frac{\pi^2}{2 \cdot (1-\nu^2)} \cdot \frac{E_f}{G_c} \cdot t_f \cdot \frac{d}{b^2} \qquad \rho = 0.011$$

$$\Omega_{m,n} := \frac{m^2 \cdot b^2}{a^2} + n^2$$

$$w_{max} := \frac{16 \cdot P \cdot b^4}{\pi^6 \cdot D} \cdot \sum_m \sum_n \frac{(-1)^{\frac{m-1}{2}} \cdot (-1)^{\frac{n-1}{2}}}{m \cdot n} \cdot \left[\frac{1 + \rho \cdot \Omega_{m,n}}{(\Omega_{m,n})^2} \right] \qquad w_{max} = 0.579$$

$$\beta_1 := \frac{16}{\pi^6} \cdot \sum_m \sum_n \frac{(-1)^{\frac{m-1}{2}} \cdot (-1)^{\frac{n-1}{2}}}{m \cdot n \cdot (\Omega_{m,n})^2} \qquad \beta_2 := \frac{16}{\pi^6} \cdot \sum_m \sum_n \frac{(-1)^{\frac{m-1}{2}} \cdot (-1)^{\frac{n-1}{2}}}{m \cdot n \cdot (\Omega_{m,n})}$$

$$w_{max} := \frac{P \cdot b^4}{D} \cdot (\beta_1 + \rho \cdot \beta_2) \qquad w_{max} = 0.579$$

$$\beta_3 := \frac{16}{\pi^4} \cdot \sum_m \sum_n \frac{(-1)^{\frac{m-1}{2}} \cdot (-1)^{\frac{n-1}{2}}}{(\Omega_{m,n})^2} \cdot \frac{m}{n} \cdot \frac{b^2}{a^2} \qquad \beta_4 := \frac{16}{\pi^4} \cdot \sum_m \sum_n \frac{(-1)^{\frac{m-1}{2}} \cdot (-1)^{\frac{n-1}{2}}}{(\Omega_{m,n})^2} \cdot \frac{n}{m}$$

$$\beta_5 := \frac{16}{\pi^4} \cdot \sum_m \sum_n \frac{b}{a \cdot (\Omega_{m,n})^2} \qquad \beta_6 := \frac{16}{\pi^3} \cdot \sum_m \sum_n \frac{(-1)^{\frac{n-1}{2}}}{n \cdot (\Omega_{m,n})} \cdot \frac{b}{a} \qquad \beta_7 := \frac{16}{\pi^3} \cdot \sum_m \sum_n \frac{(-1)^{\frac{m-1}{2}}}{m \cdot (\Omega_{m,n})}$$

$$\sigma_x := \frac{P \cdot b^2}{d \cdot t_f} \cdot (\beta_3 + \nu \cdot \beta_4) \qquad \sigma_y := \frac{P \cdot b^2}{d \cdot t_f} \cdot (\beta_4 + \nu \cdot \beta_3) \qquad \tau_{xy} := \frac{P \cdot b^2}{d \cdot t_f} \cdot (1-\nu) \cdot \beta_5 \qquad \tau_{zx} := \frac{P \cdot b}{d} \cdot \beta_6 \qquad \tau_{zy} := \frac{P \cdot b}{d} \cdot \beta_7$$

$\sigma_y = 710.692$ (Face inplane stress, psi) $\sigma_x = 614.496$ (Face inplane stress, psi)

$\tau_{xy} = 447.408$ (Face shear stress, psi) $w_{max} = 0.579$ (Deflection, in) $\%def := \frac{w_{max} \cdot 100}{a}$ $\%def = 0.536$

$\tau_{zy} = 10.114$ (Core shear stress, psi) $\tau_{zx} = 9.604$ (Core shear stress, psi)